

**EXPLORING THE RELATIONSHIP OF INNOVATION AND  
FEATURES TOWARDS NEW PRODUCT DEVELOPMENT**



**MUHAMAD HAZWAN BIN HASHIM**

**MASTER OF SCIENCE (MANAGEMENT)  
UNIVERSITI UTARA MALAYSIA  
December 2015**

**EXPLORING THE RELATIONSHIP OF INNOVATION AND FEATURES  
TOWARDS NEW PRODUCT DEVELOPMENT**



**By**  
**MUHAMAD HAZWAN BIN HASHIM**

**UUM**  
**Universiti Utara Malaysia**

**Thesis submitted to  
School of Business Management, College of Business,  
Universiti Utara Malaysia,  
In Fulfillment of the Requirement for the Master of Sciences (Management)**

## **PERMISSION TO USE**

In presenting this dissertation in partial fulfillment of the requirement for a Post Graduate degree from the Universiti Utara Malaysia (UUM), I agree that the Library of this university may make it freely available for inspection. I further agree that permission for copying this dissertation in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor or in their absence, by the Dean of School of Business Management where I did my dissertation. It is understood that any copying or publication or use of this dissertation parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the UUM in any scholarly use which may be made of any material in my dissertation.

Request for permission to copy or to make other use of materials in this dissertation in whole or in part should be addressed to:



Dean of School of Business Management  
Universiti Utara Malaysia  
06010 UUM Sintok  
Kedah Darul Aman

## ABSTRACT

The manufacturing sector is the most important component in the economic development of a country. The effect of the explosion in development of the product manufacturing world generally, especially in Asia and in Malaysia, in particular, has led to a requirement of the importance of the study was designed to investigate the relationship between product strategy, design, innovation and features towards the development of new products in manufacturing industry. The sample of this study is among employees in the manufacturing industry in Kedah. The methodology used for this study is through the quantitative method which is through Pearson correlation analysis and multiple regression analysis in which the questionnaire was distributed among employees in manufacturing industries in Kedah, Malaysia. The statistical approach used to describe the data obtained in this study. Some of the studies have been conducted to analyze data such as factor analysis, reliability test, normality test, descriptive analysis, Pearson correlation analysis and multiple regression analysis. Factor analysis was conducted to determine the number of factors selected. Multiple regression analysis was used to examine the influence of product strategy, design, innovation and product features towards new product development. Pearson correlation analysis was performed to examine whether the dimension in product strategy, design, innovation and product features have a direct relationship with the development of new products. The results showed that the product strategy, design, innovation and product features have a direct relationship with new product development. In multiple regression analysis, there is a strong influence on the product strategy and innovation towards new product development. The results of this study also show that the theory of Key Success Factors (KSFs) can increase a company's production performance. The impact of this research will provide knowledge and better understanding among researchers and entrepreneurs of the manufacturing industries in developing the formula to develop new products.

**Keywords:** Product Strategy, Design, Innovation, Features, New Product Development.

## ABSTRAK

Sektor perkilangan merupakan komponen terpenting dalam pembangunan ekonomi sesebuah negara. Pengaruh ledakan kemajuan pembangunan pembuatan produk diperingkat dunia pada amnya, khasnya di Asia dan di Malaysia, khususnya telah menimbulkan satu keperluan akan pentingnya satu kajian dijalankan untuk menyelidik hubungan di antara strategi produk, reka bentuk, inovasi dan ciri-ciri ke arah pembangunan produk baru dalam industri pembuatan. Sampel kajian ini dijalankan dalam kalangan pekerja-pekerja industri perkilangan di Kedah. Kaedah yang digunakan bagi menjalankan kajian ini adalah melalui kaedah kuantitatif iaitu melalui analisis korelasi Pearson dan analisis regresi berganda di mana soalan soal selidik telah diedarkan dalam kalangan pekerja dalam industri pembuatan di Kedah, Malaysia. Pendekatan statistik digunakan untuk menghurai data yang diperoleh dalam kajian ini. Beberapa pendekatan kajian telah dijalankan untuk menganalisis data seperti analisis faktor, ujian kebolehpercayaan, ujian kenormalan, analisis deskriptif, analisis korelasi Pearson dan analisis regrasi pelbagai. Analisis faktor dijalankan untuk menentukan beberapa faktor yang terpilih. Analisis regrasi pelbagai digunakan untuk menguji pengaruh antara strategi produk, reka bentuk, inovasi dan ciri-ciri produk terhadap pembangunan produk baru. Analisis Korelasi Pearson pula dilakukan untuk meneliti sama ada dimensi dalam strategi produk, reka bentuk, inovasi dan ciri-ciri produk mempunyai hubungan secara langsung dengan pembangunan produk baru. Hasil kajian menunjukkan bahawa strategi produk, reka bentuk, inovasi dan ciri-ciri produk mempunyai hubungan secara langsung dengan pembangunan produk baru. Dalam analisis regrasi pelbagai, terdapat pengaruh yang kuat antara strategi produk dan inovasi terhadap pembangunan produk baru. Hasil kajian ini juga memperlihatkan bahawa teori *Key Success Factors* (KSFs) dapat meningkatkan penghasilan prestasi syarikat. Kesan daripada kajian ini akan memberikan pengetahuan dan kefahaman yang lebih baik dalam kalangan penyelidik dan pengusaha industri pembuatan dalam merumuskan formula untuk membangunkan produk baru.

**Kata Kunci:** Strategi Produk, Reka Bentuk, Inovasi, Ciri-ciri, Pembangunan Produk Baru

## **ACKNOWLEDGEMENT**

### **In the Name of Allah, the Most Forgiving and the Most Merciful**

All praise belongs to Allah whom we worship. I would like to extend my deepest gratitude and thanks to Allah the Almighty for giving me excellent health, energy, and capability to complete my thesis.

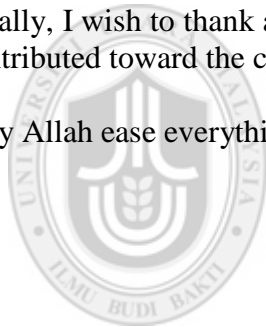
Special thanks to my beloved father and mother, Hashim bin Mat and Rohana binti Ishak who never stop praying for my success and also to my family members as well for their support, understanding, and patience throughout my study.

My deepest appreciation goes to my academic supervisor; Associated Prof. Dr. Amlus bin Ibrahim. Thank you for your valuable time, guidance, opinions, suggestions, and encouragement throughout the preparation of this study.

I also wish to thank my friends and other lecturers in Universiti Utara Malaysia. Without their endless assistance, attention, care, encouragement, and sacrifice, it would have been hard for me to complete this study.

Finally, I wish to thank all individuals and institutions that have directly or indirectly contributed toward the completion of my Master dissertation.

May Allah ease everything that you do.



Universiti Utara Malaysia

## TABLE OF CONTENTS

CERTIFICATION OF RESEARCH PAPER .....	i
PERMISSION TO USE .....	ii
ABSTRACT.....	iii
ABSTRAK.....	iv
ACKNOWLEDGEMENT .....	v
TABLE OF CONTENTS.....	vi
LIST OF TABLES .....	viii
LIST OF FIGURES .....	ix
LIST OF APPENDICES .....	x

<b>CHAPTER ONE: INTRODUCTION .....</b>	<b>1</b>
1.1 Introduction .....	1
1.2 Background of the Study.....	3
1.3 Problem Statement .....	6
1.4 Research Questions .....	10
1.5 Research Objectives .....	10
1.6 Significance of the Study .....	11
1.6.1 Theoretical Significance .....	11
1.6.2 Practical Managerial Significance .....	12
1.7 Scope of the Study .....	13
<b>CHAPTER TWO: LITERATURE REVIEW .....</b>	<b>15</b>
2.1 Introduction .....	15
2.2 Theoretical Underpinning .....	16
2.3 Conceptual Definition .....	17
2.3.1 New Product Development .....	17
2.3.2 Product Strategy .....	20
2.3.3 Design .....	23
2.3.4 Innovation .....	26
2.3.5 Features .....	30
2.4 Conclusion .....	33
<b>CHAPTER THREE: RESEARCH METHODOLOGY .....</b>	<b>36</b>
3.1 Introduction .....	36
3.2 Research Framework.....	37
3.3 Hypotheses Development.....	38
3.4 Research Design.....	40
3.5 Operational Definition .....	41
3.5.1 New Product Development .....	41
3.5.2 Product Strategy .....	42
3.5.3 Design .....	42

3.5.4 Innovation .....	43
3.5.5 Features .....	43
3.6 Data Collection Process .....	43
3.7 Sampling Design .....	44
3.7.1 Population of Interest .....	44
3.7.2 Target Population .....	45
3.7.3 Sampling Frame .....	45
3.7.4 Sampling Technique .....	46
3.7.5 Unit of Analysis .....	47
3.7.6 Type of Study .....	47
3.8 Data Analysis Technique .....	48
3.8.1 Factor Analysis .....	49
3.8.2 Reliability Test .....	49
3.8.3 Normality Test .....	50
3.8.4 Descriptive Analysis .....	50
3.8.5 Pearson Correlation Analysis .....	51
3.8.6 Multiple Regression Analysis .....	52
3.9 Conclusion .....	53
 <b>CHAPTER FOUR: DATA ANALYSIS AND FINDINGS.....</b>	<b>55</b>
4.1 Introduction .....	55
4.2 Pilot Study .....	55
4.3 Factor Analysis .....	56
4.4 Reliability Test .....	59
4.5 Normality Test .....	59
4.6 Descriptive Analysis of Respondent's Background.....	60
4.7 Pearson Correlation Analysis .....	65
4.8 Multiple Regression Analysis .....	67
4.9 Conclusion .....	70
 <b>CHAPTER FIVE: CONCLUSION AND RECOMMENDATION.....</b>	<b>71</b>
5.1 Introduction .....	71
5.2 Summary of the Findings .....	71
5.3 Significance of the Study .....	74
5.3.1 Theoretical Significance .....	74
5.3.2 Practical Managerial Significance .....	75
5.4 Limitation of the Study .....	76
5.5 Recommendation of the Future Research .....	76
5.6 Conclusion .....	78
 <b>REFERENCES.....</b>	<b>80</b>



## LIST OF TABLES

Table 2.1 The others Innovation Definitions .....	28
Table 3.1 Statistical Analysis .....	48
Table 3.2 The Coefficient Scale and Relationship Strength of Correlation.....	51
Table 4.1 Result of Factor Analysis for Independent Variable.....	57
Table 4.2 Result of Factor Analysis for Dependent Variable .....	58
Table 4.3 Cronbach's Alpha for each Variable.....	59
Table 4.4 Employee's Position in Company.....	60
Table 4.5 Types of Department in Company .....	61
Table 4.6 Years of Employee's Working Experience.....	61
Table 4.7 Employee's Educational Level .....	62
Table 4.8 Employee's Experience with Design or Innovation of the Product.....	63
Table 4.9 Employee's Experience in Engaging with New Product Development ....	63
Table 4.10 Company's Product Launch in Last 5 Years .....	64
Table 4.11 Percentage of Company's Expenditure towards R&D per Year.....	64
Table 4.12 Correlation between Independent Variables and New Product Development (N=130) .....	65
Table 4.13 Multiple Regression Result.....	67
Table 4.14 Summary of All Hypotheses (N=130) .....	69
Table 5.1 Summary of All Hypotheses Testing Result (N=130) .....	73



**UUM**  
Universiti Utara Malaysia

## LIST OF FIGURES

Figure 3.1. Research Framework. ....	38
Figure 3.2. Model Formula for Multiple Regressions .....	53



## LIST OF APPENDICES

Appendix A List of Manufacturing Industries in Kedah .....	89
Appendix B Permission Letter .....	93
Appendix C Questionnaire .....	94
Appendix D Factor Analysis .....	99
Appendix E Reliability Test .....	104
Appendix F Normality Test .....	106
Appendix G Descriptive Analysis .....	109
Appendix H Pearson Correlation Analysis .....	111
Appendix I Multiple Regression Analysis .....	112



**UUM**  
Universiti Utara Malaysia

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Introduction**

New product development is a very complex task. Society is as end users need to back up ideas from the production of products that are on the market now that has gone through many stages, over a long period and it should be done according to certain procedures. The company should cooperate with each other with the user, mutual restraint, to make adjustments to the product development smoothly. Product development process is proposed product from concept to put into the entire production process. Due to the differences in production technology and characteristics different from the industry, new product development experience is not entirely the same.

To develop a new product, there are several aspects that need to be evaluated first which are product strategy, product design, innovation and also the product features. A company should make a long-term plan for the development of a new product by formulating several strategies including product strategy. The product strategy is a form of planning and implementation for developing a product in the industry. Products are created or produced by a company should implement an effective product strategy for ensuring the product can compete in the market.

The contents of  
the thesis is for  
internal user  
only



UUM  
Universiti Utara Malaysia

## REFERENCES

- Amabile, T. M., Conti, R., Coon, H., Lazenby, J., & Herron, M. (1996). Assessing the work environment for creativity. *Academy of management journal*, 39(5), 1154-1184.
- Amirmudin Bin Udin (2007). *Rekabentuk Industri*. Edisi 2. Jabatan Pendidikan Teknikal Dan Kejuruteraan, Fakulti Pendidikan, UTM.
- Arash Shahin (2008). *Quality Function Deployment: A Comprehensive Review*. Department Of Management, University Of Isfahan, Isfahan, Iran.
- Barczak, G. (1995). New product strategy, structure, process, and performance in the telecommunications industry. *Journal of Product Innovation Management*, 12(3), 224-234.
- Berry, L. (1981). The employee as customers. *Journal of Retail Banking*, 3(7), 25-80.
- Bhatti, M., & Kaliani Sundram, V. (2015). *Business Research: Quantitative and Qualitative Methods*. Kuala Lumpur: Pearson Malaysia Sdn Bhd.
- Boeker, W. P. (1989). Strategic Change: The effects of founding and history. *Academy of Management Journal*, 32: 489-515
- Brown, S. L., & Eisenhardt, K. M. (1995). Product development: Past research, present findings, and future directions. *Academy of management review*, 20(2), 343-378.
- Bullen CB, Rockart JF (1981). A Primer on Critical Success Factors, *CISR Working Paper*, Center for Information Systems Research, Sloan School of Management, MIT, Cambridge, MA.

- Bullen, P. B. (2014). *Select the pilot sample*, How to Pretest and Pilot a Survey Questionnaire.
- Chang, F., Lin, S., & Yu, H. (2007). An Optimal Time-Cost Model for Product Design. *Journal of Accounting, Finance & Management Strategy*, 3(2), 23-38.
- Coakes, S. J., and Steed, L. (2007). *SPSS: Analysis without Anguish Using SPSS Version 14.0 for Windows*. Australia: John Wiley & Sons Australia, Ltd.
- Coskun Samli, A., & Weber, J. (2000). A theory of successful product breakthrough management: learning from success. *Journal of Product & Brand Management*, 9(1), 35-55. doi:10.1108/10610420010316320
- Cumming, B. S. (1998). Innovation overview and future challenges. *European journal of innovation management*, 1(1), 21-29.
- Darawong, C., & Igel, B. (2012). Acculturation of local new product development team members in MNC subsidiaries in Thailand. *Asia Pac Journal Of Marketing & Log*, 24(3), 351-371. doi:10.1108/13555851211237687
- Day, G.S., (1990) *Market Driven Strategy: Processes for Creating Value*, New York and London: The Free Press.
- Department of Statistics Malaysia (2013). *Report on The Annual Survey of Manufacturing Industries 2012*. Retrieved from [https://www.statistics.gov.my/index.php?r=column/cthemByCat&cat=92&bul\\_id=enZUVDZxcHI5c1NFYzNSeUtxYWh3QT09&menu\\_id=SjgwNXdiM0JIT3Q2TDBIWXdKdUVldz09](https://www.statistics.gov.my/index.php?r=column/cthemByCat&cat=92&bul_id=enZUVDZxcHI5c1NFYzNSeUtxYWh3QT09&menu_id=SjgwNXdiM0JIT3Q2TDBIWXdKdUVldz09)
- Dolan, R.J. and Simon, D. (1996), *Power Pricing: How Managing Price Transforms the Bottom Line*, The Free Press, New York, NY.

- Doyle, P., (1990) Building Successful Brands: the Strategic Options, *Journal of Consumer Marketing*, Vol.7, pp.5-22.
- Farduhar, P. H. (1990) Managing Brand Equity, *Journal of Advertising Research*, Vol.30, pp.7-12.
- Felekoglu, B., & Moultrie, J. (2014). Top management involvement in new product development: A review and synthesis. *Journal of Product Innovation Management*, 31(1), 159-175.
- Ford, D., & Sterman, J. (1998). Dynamic modeling of product development processes. *System Dynamics Review*, 14(1), 31-68. doi:10.1002/(sici)1099-1727
- Freng Svendsen, M., Haugland, S. A., Grønhaug, K., & Hammervoll, T. (2011). Marketing strategy and customer involvement in product development. *European Journal of Marketing*, 45(4), 513-530.
- George, D. and Mallery, M. (2010). *SPSS for Windows Step by Step: A Simple Guide and Reference, 17.0 update* (10a ed.) Boston: Pearson.
- Gliner, J. A., Morgan, G. A., and Leech, N. L. (2009). *Research Method in Applied Settings: An Integrated Approach to Design and Analysis*. New York: Taylor & Francis Group, LLC.
- Grönroos, C. (1994). From marketing mix to relationship marketing: towards a paradigm shift in marketing. *Management decision*, 32(2), 4-20.
- Gruenwald, G. (1985). *New Product Development: What Really Works*. Jakarta: PT Elex Media Komputindo.



- Hafiz, M. (2010). *The Relationship between Marketing Mix Strategies and Customer Loyalty: A Study in Food and Beverage Sector* (Master). Universiti Utara Malaysia.
- Hair, J. F. J., Money, A. H., Samouel, P., and Page, M. (2008). *Research Method for Business. England*. West Sussex: John Wiley & Sons.
- Hair, J. F., Black, W. C., Babin, B. J., and Anderson, R. E. (2010). *Multivariate Data Analysis (7th Ed.)*. New Jersey: Prentice Hall, Inc.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., and Tatham, R. L. (2006). *Multivariate Data Analysis (6th Ed.)*. New Jersey: Prentice Hall, Inc.
- Hassanien, A., & Dale, C. (2012). Drivers and barriers of new product development and innovation in event venues. *Journal Of Facilities Management*, 10(1), 75-92. doi:10.1108/14725961211200414
- Helander (2006). A Kansei Mining System For Affective Design. *Expert Systems With Applications*. (30) 658–673.
- Ibrahim, S., & Fallah, M. H. (1989). Drivers of innovation and influence of technological clusters. *Engineering Management Journal*, 17(3), 33-41.
- Ilori, M. O., Oke, J. S., & Sanni, S. A. (2000). Management of new product development in selected food companies in Nigeria. *Technovation*, 20(6), 333-342.
- Ingenbleek, P. T., & van der Lans, I. A. (2013). Relating price strategies and price-setting practices. *European Journal of Marketing*, 47(1/2), 27-48.

Jawaris, S. (2013). *Kajian Pendekatan Instruksional Untuk Analisis Rekabentuk Afektif Daripada Ulasan Produk* (Master Degree). Universiti Tun Hussein Onn Malaysia.

Jaworski, B., & Kohli, A. K. (1993). Market orientation: Antecedents and consequences. *Journal of Marketing*, 57, 53–70.

Jianxin (Roger) Jiao, Yiyang Zhang & Martin Ingenbleek, P., & van der Lans, I. (2013). Relating price strategies and price setting practices. *European Journal of Marketing*, 47(1/2), 27-48. doi:10.1108/03090561311285448

Jiao, S. J., Zhang, Z. Z., Lu, Y. M., Shen, D. Z., Yao, B., Zhang, J. Y., ... & Tang, Z. K. (2006). ZnO pn junction light-emitting diodes fabricated on sapphire substrates. *Applied physics letters*, 88(3), 031911.

Keller, G. (1998). *Equilibrium states in ergodic theory* (Vol. 42). Cambridge university press.

Ketelhöhn W (1998). What is a key success factor? *European. Management Journal*. 16(3):335-340.

Kim, J. O. and Mueller, C. W. (1994). Introduction to Factor Analysis: What It Is and How to Do It. In M. S. Lewis-Beck, *Factor Analysis and Related Techniques* (pp. 1-69). Singapore: Toppan Co. (S) Pte Ltd.

Kotler, P., & Armstrong, G. (1993). *Marketing: An introduction*, Pearson Education.

Kotler, P., Keller, K., Ang, S., Leong, S., & Tan, C. (2012). *Marketing Management: An Asian Perspective* (6th ed., p. 416). Singapore: Pearson.

- Krieg, R. (2004). Impact of structured product definition on market success. *International Journal Quality & Reliability Management*, 21(9), 991-1002. doi:10.1108/02656710410561808
- Krishnan, V., & Ulrich, K. T. (2001). Product development decisions: A review of the literature. *Management science*, 47(1), 1-21.
- Kuemmerle, W. (1998). Optimal scale for research and development in foreign environments an investigation into size and performance of research and development laboratories abroad. *Research Policy*, 27(2), 111-126.
- Lamb, C., Hair, J., McDaniel, C., Summers, J., & Gardiner, M. (2009). *Marketing* South Melbourne: Cengage Learning.
- Lee, Y., Cheng, S., & Chen, C. (2008). Use of the 4Ps Model to Examine Differences between Generic and Brand Marketing Strategies. *The Journal of Human Resource and Adult Learning*, 4(2).
- Link, A. N., & Bauer, L. L. (1989). Cooperative research in US manufacturing: , IL: *Assessing policy initiatives and corporate strategies*. Free Press.
- McCarthy, E. J. (1960). *Basic marketing: A managerial approach*. Homewood Irwin.
- McGrath, M.E. (1995), *Product Strategy for High-technology Companies: How to Achieve Growth, Competitive Advantage, and Increased Profits*, McGraw-Hill, New York, NY.
- Neeleman, D. (2001). *Birth of an Airline*. Harvard Business School
- Ozer, M., & Cebeci, U. (2010). The role of globalization in new product development. *Engineering Management, IEEE Transactions on*, 57(2), 168-180.

- Pitta, D., & Scherr, B. (2009). The product strategy for seasonal products. *Journal Of Product & Brand Management*, 18(2), 152-153.  
doi:10.1108/10610420910949059
- Pujari, D., Wright, G., & Peattie, K. (2003). Green and competitive: influences on environmental new product development performance. *Journal of Business Research*, 56(8), 657-671.
- Rashid, M. H. (2010). *Power electronics handbook: devices, circuits and applications*. Academic press.
- Rindfleisch, A., & Moorman, C. (2001). The acquisition and utilization of information in new product alliances: A strength-of-ties perspective. *Journal of marketing*, 65(2), 1-18.
- Robbins, S. (1994). *Management*. Englewood Cliffs, N.J.: Prentice Hall.
- Roger, D. S., Gamans, L. R. and Grassi, M. T., 1991, *Retailing: New Perspectives*, 2<sup>th</sup>ed, Orlando, FL: Dryden Press.
- Rogers, E. M. (1983). Diffusion of innovations. *New York: Free Press*, 18(20), 271.
- Schumpeter, J. A. (1989). *Essays: On entrepreneurs, innovations, business cycles, and the evolution of capitalism*. Transaction Publishers.
- Sekaran, U. (2006). *Research Method of Business: A Skill-Building Approach* (4<sup>th</sup> ed., pp. 116-140). John Wiley & Sons, Inc.
- Sekaran, U., & Bougie, R. (2013). *Research Methods for Business: A Skill-Building Approach, 6th Edition* (6th ed.). New York City: Wiley.

- Sekaran, U., & Bougie, R.. (2003). *Research methods for business: A skill building approach*. John Wiley and Sons Inc., New York.
- Tabachnick, G. G. and Fidell, L. S. (2007). *Experimental Designs Using ANOVA*. Belmont, CA: Duxbury.
- Utterback, J., & Abernathy, W. (1975). A dynamic model of process and product innovation. *Omega*, 3(6), 639-656. [http://dx.doi.org/10.1016/0305-0483\(75\)90068-7](http://dx.doi.org/10.1016/0305-0483(75)90068-7)
- Van Waterschoot, W., & Van den Bulte, C. (1992). The 4P classification of the marketing mix revisited. *The Journal of Marketing*, 83-93
- Veryzer, R. W. (1998). Discontinuous innovation and the new product development process. *Journal of product innovation management*, 15(4), 304-321.
- Wang, J., Doussin, J. F., Perrier, S., Perraudin, E., Katrib, Y., Pangui, E., & Picquet-Varrault, B. (2011). Design of a new multi-phase experimental simulation chamber for atmospheric photosmog, aerosol and cloud chemistry research. *Atmospheric Measurement Techniques*, 4(11), 2465-2494.
- Yamane, T. (1967). *Elementary sampling theory*. the University of Michigan: Prentice-Hall.
- Yang, L. R. (2012). Implementation of project strategy to improve new product development performance. *International Journal of Project Management*, 30(7), 760-770.
- Yazdani, B. (1999). Four Models of Design Definition: Sequential, Design Centered, Concurrent and Dynamic. *Journal Of Engineering Design*, 10(1), 25-37.

Yudelson, J. (1999). Adapting Mccarthy's Four P's for the Twenty-First Century. *Journal Of Marketing Education*, 21(1), 60-67.doi:10.1177/0273475399211008

Yue Wang, Mitchell M. Tseng (2011). Comprehensive Customer Requirements Into Product Design. *Cirp Annals - Manufacturing Technology*. (60) 175–178.

Zeng, Y., & Gu, P. (1999). A science-based approach to product design theory Part I: formulation and formalization of design process. *Robotics And Computer-Integrated Manufacturing*, 15(4), 331-339. [http://dx.doi.org/10.1016/s0736-5845\(99\)00028-9](http://dx.doi.org/10.1016/s0736-5845(99)00028-9)

Zhai, Z., Liu, B., Xu, H., & Jia, P. (2011, February). Clustering product features for opinion mining. In *Proceedings of the fourth ACM international conference on Web search and data mining* (pp. 347-354). ACM.

